

Military Logic Products

Quad Two-Input NAND Gates

Product Specification

FUNCTION TABLE

INPUTS		OUTPUT
A	B	Y
L	L	H
L	H	H
H	L	H
H	H	L

H = HIGH voltage level
L = Low voltage level

ORDERING INFORMATION

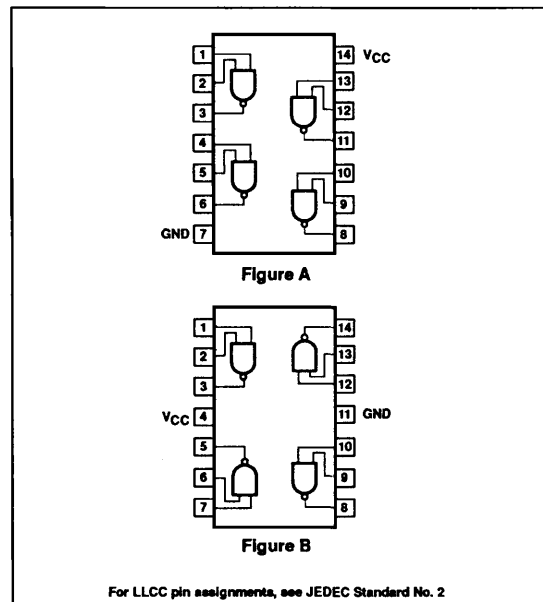
DESCRIPTION	PIN CONFIGURATION	ORDER CODE
Ceramic DIP	Figure A	5400/BCA, 54LS00/BCA, 54S00/BCA
Ceramic Flat Pack	Figure A	54LS00/BDA, 54S00/BDA
	Figure B	5400/BDA
Ceramic LLCC	See Note	54LS00/B2A, 54S00/B2A

INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

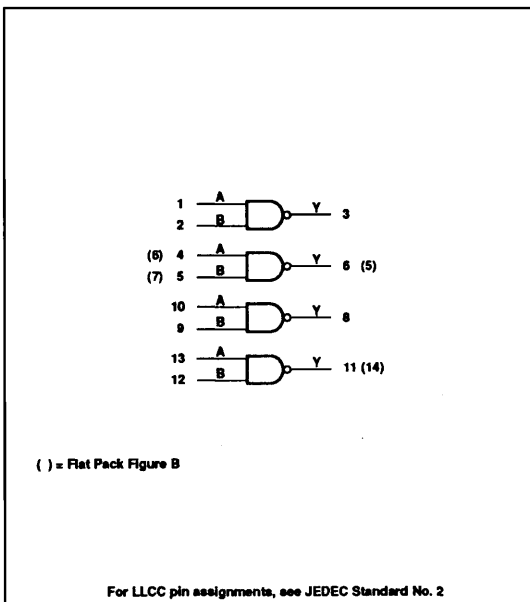
PINS	DESCRIPTION	54	54S	54LS
A, B	Inputs	1UL	1SUL	1LSUL
Y	Output	10UL	10SUL	10LSUL

NOTE: Where a 54 Unit Load (UL) is understood to be $40\mu\text{A } I_{IH}$ and $-1.6\text{mA } I_{IL}$, a 54S Unit Load (SUL) is $50\mu\text{A } I_{IH}$ and $-2.0\text{mA } I_{IL}$, and a 54LS Unit Load (LSUL) is $20\mu\text{A } I_{IH}$ and $-0.4\text{mA } I_{IL}$.

PIN CONFIGURATION



LOGIC SYMBOL



Gates**5400, 54LS00, 54S00****ABSOLUTE MAXIMUM RATINGS** Over operating free-air temperature range unless otherwise noted

SYMBOL	PARAMETER	54	54LS	54S	UNIT
V_{CC}	Supply voltage	7.0	7.0	7.0	V
V_I	Input voltage range	-0.5 to +5.5	-0.5 to +7.0	-0.5 to +7.0	V
I_I	Input current range	-30 to +5	-30 to +1	-30 to +5	mA
V_O	Voltage applied to output in High output state range	-0.5 to + V_{CC}	-0.5 to + V_{CC}	-0.5 to + V_{CC}	V
T_{STG}	Storage temperature range	-65 to +150			°C

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	54			54LS			54S			UNIT
		Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	
V_{CC}	Supply voltage	4.5	5.0	5.5	4.5	5.0	5.5	4.5	5.0	5.5	V
V_{IH}	High-level input voltage	2.0			2.0			2.0			V
V_{IL}	Low-level input voltage			+0.8			+0.7			+0.8	V
I_{IK}	Input clamp current			-12			-18			-18	mA
I_{OH}	High-level output current			-400			-400			-1000	μA
I_{OL}	Low-level output current			16			4			20	mA
T_A	Operating free-air temperature range	-55		+125	-55		+125	-55		+125	°C

DC ELECTRICAL CHARACTERISTICS Over recommended operating free-air temperature range unless otherwise noted

SYMBOL	PARAMETER	TEST CONDITIONS ¹	5400			54LS00			54S00			UNIT
			Min	Typ ²	Max	Min	Typ ²	Max	Min	Typ ²	Max	
V_{OH}	High-level output voltage	$V_{CC} = \text{Min}, V_{IH} = \text{Min}, V_{IL} = \text{Max}, I_{OH} = \text{Max}$	2.4	3.4		2.5	3.4		2.5	3.4		V
V_{OL}	Low-level output voltage	$V_{CC} = \text{Min}, V_{IH} = \text{Min}, I_{OL} = \text{Max}$		0.2	0.4		0.25	0.4			0.5	V
V_{IK}	Input clamp voltage	$V_{CC} = \text{Min}, I_I = I_{IK}$			-1.5			-1.5			-1.2	V
I_{IH2}	Input current at maximum input voltage	$V_{CC} = \text{Max}$ $V_I = 5.5\text{V}$			1.0						1.0	mA
		$V_I = 7.0\text{V}$						0.1				mA
I_{IH1}	High-level input current	$V_{CC} = \text{Max}$ $V_I = 2.4\text{V}$			40							μA
		$V_I = 2.7\text{V}$						20			50	μA
I_{IL}	Low-level input current	$V_{CC} = \text{Max}$ $V_I = 0.4\text{V}$			-1.6			-0.4				mA
		$V_I = 0.5\text{V}$									-2.0	mA
I_{OS}	Short-circuit output current ³	$V_{CC} = \text{Max}$	-20		-55	-20		-100	-40		-110	mA
I_{CC}	Supply current (total)	$V_{CC} = \text{Max}$ I_{CCH} Outputs High		4	8		0.8	1.6		10	16	mA
		I_{CCL} Outputs LOW		12	22		2.4	4.4		20	36	mA

Gates

5400, 54LS00, 54S00

AC ELECTRICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$, $V_{CC} = 5.0\text{V}$

SYMBOL	PARAMETER	TEST CONDITIONS	54 ⁴		54LS		54S		UNIT
			C _L = 15pF		C _L = 15pF		C _L = 15pF		
			Min	Max	Min	Max	Min	Max	
t _{PLH} t _{PHL}	Propagation delay	Waveform 1		22 15		15 15		4.5 5.0	ns ns

AC ELECTRICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$, $V_{CC} = 5.0\text{V}$

SYMBOL	PARAMETER	TEST CONDITIONS	54		54LS ⁴		54S ⁴		UNIT
			C _L = 50pF		C _L = 50pF		C _L = 50pF		
			Min	Max	Min	Max	Min	Max	
t _{PLH} t _{PHL}	Propagation delay	Waveform 1		26 19		20 20		7.0 7.5	ns ns

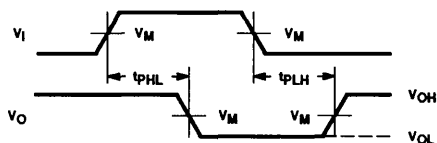
AC ELECTRICAL CHARACTERISTICS $T_A = -55^\circ\text{C}$ and $+125^\circ\text{C}$, $V_{CC} = 5.0\text{V}$ ⁴

SYMBOL	PARAMETER	TEST CONDITIONS	54		54LS		54S		UNIT
			C _L = 50pF		C _L = 50pF		C _L = 50pF		
			Min	Max	Min	Max	Min	Max	
t _{PLH} t _{PHL}	Propagation delay	Waveform 1		34 25		26 26		9 9	ns ns

NOTES:

- For conditions shown as Min or Max, use the appropriate value specified under recommended operating conditions for the applicable type and function table operating mode.
- All typical values are at $V_{CC} = 5\text{V}$, $T_A = 25^\circ\text{C}$.
- Not more than one output should be shorted at a time, and duration of the short should not exceed one second.
- These parameters are guaranteed, but not tested.

AC WAVEFORM



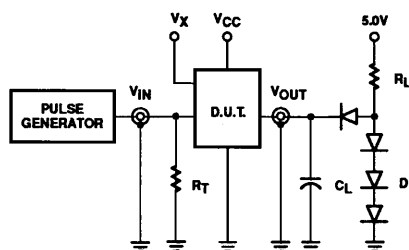
Waveform 1. Waveform for Inverting Outputs

NOTE: $V_M = 1.3\text{V}$ for 54LS/S; $V_M = 1.5\text{V}$ for all other TTL families.

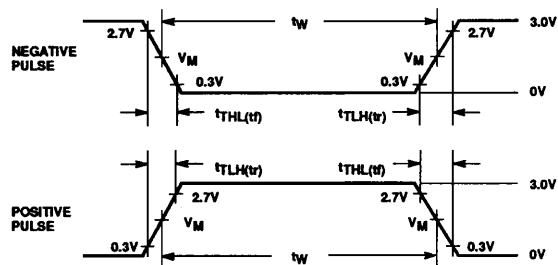
Gates

5400, 54LS00, 54S00

TEST CIRCUIT AND WAVEFORM



Test Circuit for 54 Totem-Pole Outputs



Input Pulse Definition

FAMILY	INPUT PULSE CHARACTERISTICS					
	R_L	V_M	Rep. Rate	T_W	T_{TLH}	T_{THL}
54LSXXX	2.0k Ω	1.3V	1MHz	500ns	≤ 15 ns	≤ 6 ns
54XXX	400 Ω	1.5V	1MHz	500ns	≤ 7 ns	≤ 7 ns
54SXXX	280 Ω	1.5V	1MHz	500ns	≤ 2.5 ns	≤ 2.5 ns

DEFINITIONS:

C_L = Load capacitance includes jig and probe capacitance; see AC Characteristics for value.

R_T = Termination resistance should be equal to Z_{OUT} of Pulse Generators.

D = Diodes are 1N916, 1N3064, or equivalent.

V_X = Unlocked pins must be held at $\leq 0.8V$, $\geq 2.7V$ or open per Function Table.